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SERUM IMMUNOGLOBULIN E AND VITAMIN D_3 IN BRONCHIAL ASTHMA

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ABSTRACT

Objective: To determine the association of serum immunoglobulin E (IgE) and vitamin D_3 in bronchial asthma. **Study Design:** Case control study. **Place and Duration:** Department of Medicine -Liaquat University of Medical and Health Sciences Hospital from January 2015- September 2016. **Subjects and Methods:** A sample of 100 subjects was divided into 50 cases of bronchial asthma and 50 controls. Ethical permission and consent was taken. Venous blood samples were collected. Blood complete picture, serum IgE and vitamin D_3 were estimated. Performa was used for data collection. *Statistix 8.1 version* (USA) was used for data analysis at 95% confidence interval ($P \leq 0.05$). **Results:** Mean ± SD age noted in controls and cases was 52.73±7.39 and 54.42 ±5.89 years respectively. Blood Eosinophils in the in cases were noted as 5.85 ± 2.32 compared to 3.38 ± 1.72 % per µL in controls (P=0.0002). Controls showed Vitamin D_3 35.24±11.74 ng/dl vs. 22.06±13.6 ng/dl in cases (P=0.0003). Serum IgE in controls and cases was noted as 80.60±15.95 and 551.5±372.31 IU/ml (P=0.0001). Serum IgE and blood eosinophils showed negative correlation with vitamin D_3 (r= -0.485, P= 0.0001 and r= -0.75, P= 0.0001 respectively). **Conclusion:** The present study shows raised serum IgE and low vitamin D_3 in bronchial asthma. Serum IgE shows negative association with vitamin D_3.

KEYWORDS: Bronchial Asthma, IgE, Vitamin D_3, Eosinophils.

INTRODUCTION

Bronchial Asthma is a clinical entity of bronchospasm characterized by chronic airways inflammation of lungs. Patients suffering from bronchial asthma reveal the symptoms of shortness of breath (SOB), chest tightness, cough and wheezing. When severe, it may be life threatening due to exhaustion of respiratory muscles, poor respiratory effort, defective gas exchange and respiratory failure. Hypoxia and hypercapnia is the hallmark of asthma severity. Airway bronchospasm shows diurnal variation of time and intensity with limited expiratory airflow rate.[1] Research on the role of vitamin D in the various diseases has been reported. The vitamin D_3 belongs to the secosteroid family. Primarily, it plays role in calcium and phosphate homeostasis and bone mineralization. However, immunomodulatory and immuno enhancing role is now established also.[2] Bronchial asthmatics are reported to be suffering from the vitamin D_3 deficiency. A previous study[3] reported halting of asthma symptoms and improved steroid response to the vitamin D_3 supplementation positively. It is proposed that the vitamin D_3 deficiency increases lung airway responsiveness and steroid resistance. A decrease in lung volumes and capacities with decreased therapeutic response has been suggested in vitamin D deficient asthmatics.[4] Role of vitamin D_3 is debatable as a lot of research has linked the association with asthma. The vitamin D_3 deficiency has been reported to be associated with increased incidence of asthma and allergy.[5] Vitamin D_3 deficiency has been reported as a predictor of atopy and childhood asthma.[6] Protective role of vitamin D_3 against infections and asthma related morbidity has been reported. Now the association of vitamin D_3 and infections is an established fact.[7,8] Vitamin D_3 halts the bronchial inflammatory response in viral infections with a feeling of relief of clinical symptoms. Respiratory research has shown negative association of serum vitamin D_3, FEV1 and FVC in asthma.[9,10] Elevated serum IgE is a hallmark of atopic asthma.[11] A growing body of research has reported on the association of vitamin D_3 in the allergic disorders, but inconsistent results have been reported.[11] As regards the link of vitamin D_3 and IgE in bronchial asthma, it needs to be researched in our indigenous population, and there

is need to research for an effective patient management. The present study was conducted to determine the serum IgE and vitamin D_3 in bronchial asthma patients presenting at our tertiary care hospital.

SUBJECTS AND METHODS

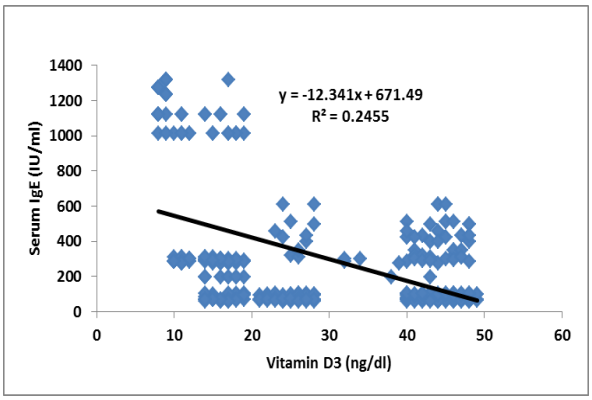
The present case control study took place at the Department of Medicine, Liaquat University of Medical and Health Sciences, Jamshoro from January 2015-September 2016. A sample of 100 subjects was divided into 50 cases of bronchial asthma and 50 controls. Study subjects were selected through non-probability (purposive) sampling. Diagnosis of bronchial asthma was as per Global Initiative for Asthma (GINA) 2015. Subjects of 20-60 years with a diagnosis of bronchial asthma were the inclusion criterion. Bronchial asthma associated with chronic obstructive pulmonary disease, lung fibrosis, chronic inflammatory lung disease, Diabetes mellitus, coronary artery disease, and subjects taking steroid therapy were excluded. Study subjects taking vitamin pills, vitamin D supplements and multivitamin- multi mineral formulations were excluded strictly. Subjects were communicated preliminary for segregation of those willing for the entry into the study protocol. Volunteer subjects were negotiated for the purpose of study, benefits and hazards. Detailed biodata and medical history was taken. Family history of asthma and allergy was enquired. First a patient was examined by a medical officer, followed by a physician. Nursing protocol was provided for the patient interview, history and blood sampling. Venous blood samples were taken from ante cubital vein under strict aseptic conditions. 5 ml blood was taken into EDTA tubes and vacutainers. Sera were separated for the estimation of serum IgE and vitamin D_3. EDTA bottles samples were used for the blood eosinophils counts. Data was collected on pre designed performa. Vitamin D_3 was estimated on the ARCHITECT I 1000 system. Serum IgE was detected by ELISA method. Consent form was mandatory to sign by volunteers in advance. Biodata, medical history and laboratory investigations were kept confidential. Ethical review permission was taken from the institute`s review committee. Data was analysed on *Statistix 8.1 version* (USA) was used for data analysis. Student t-test, Chi-square test and Pearson`s correlation were used for the continuous, and categorical variables and association of serum IgE, eosinophils and vitamin D_3. Microsoft Excel sheet was used for the scatter plots. Analysis was performed at 95% confidence interval ($P \leq 0.05$).

RESULTS

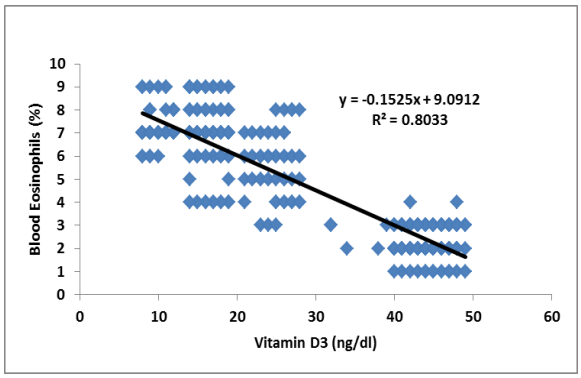
Of 50 controls and 50 cases, male were 27 and 23 and female were 29 and 21 respectively (P=0.63). Mean ± SD age noted in controls and cases was 52.73±7.39 and 54.42 ±5.89 years respectively (table 1). Blood Eosinophils were raised in the asthmatics 5.85 ± 2.32 compared to 3.38 ± 1.72 % per µL controls (P=0.0002). Controls showed Vitamin D_3 35.24±11.74 ng/dl compared to cases 22.06±13.6 ng/dl respectively (P=0.0003). Serum IgE in controls and cases was noted as 80.60±15.95 and 551.5±372.31 IU/ml. respectively (P=0.0001). Serum IgE showed significant negative correlation with vitamin D_3 (r= -0.485, P= 0.0001). Similarly blood eosinophils showed negative association with vitamin D_3 (r= -0.75, P= 0.0001). Scatter plots A and B show the association of IgE, Vitamin D_3 and blood eosinophils.

Table: 1. Demographic and laboratory findings in controls and cases

	Controls (n=50)	Cases (n=50)	P-value
Age (years)	52.73±7.39	54.42 ±5.89	0.042
Body weight (Kg)	75.7± 10.9	75.5±10.18	0.90
Systolic BP (mmHg)	141.7±19.8	140.9±18.9	0.80
Diastolic BP (mmHg)	80.9±14.91	81.0±13.15	0.53
Serum Creatinine (mg/dl)	1.11±0.09	1.04±0.31	0.89
Blood Eosinophils (%)	3.38±1.72	5.85±2.32	0.0002
Serum IgE (IU/ml)	80.60±15.95	551.5±372.31	0.0001
Vitamin D_3 (ng/dl)	35.97±12.01	23.05±12.96	0.0003



Graph A. Scatter plot of serum IgE and Vitamin D_3



Graph B. Scatter plot of blood Eosinophils and Vitamin D_3

DISCUSSION

The present study was conducted to estimate association of IgE and vitamin D_3 in bronchial asthma at our tertiary care hospital. Bronchial asthma patients showed vitamin D_3 deficiency and elevated serum IgE and blood eosinophils ($P<0.05$). The findign of vitamin D_3 deficiency in bronchial asthma is in keeping with previous studies,[12,13] this points towards clinical significance of vitamin D_3 if supplemented timely may positively benefit the bronchial asthma patients. The finding of vitamin D_3 deficiency in bronchial asthma was reported in atopic childhood asthma in a previous study.[14] A previous study[15] postulated that the vitamin D_3 deficiency weakens the immunity and makes the persons prone to infections. Vitamin D_3 deficiency may result in exaggeration of asthma symptoms. The role has been explained in the immune reactions at the molecular level. Another previous study[16] reported conflicting results that the vitamin D_3 deficiency may be because of dietary deficiency and sunlight exposure. The finding is inconsistent with present and previous studies.[14,15] The reason could be different study design and inclusion and exclusion criteria, faulty techniques of vitamin D_3 estimation, different geographical areas, ethnicity, researcher bias and statistical analysis. The reason could be because the sunlight exposure is a generalized problem of the population and this most probably have biased the results. It is evident that the vitamin D_3 modulates immune reactions through T-immune cells and microbial killing.[17] Vitamin D_3 deficiency is speculated to dysregulate the allergic reactions, exaggeration of allergic phenomena and aggravation of allergic symptoms as in bronchial asthma[16] But again the question remains unresolved why vitamin D_3 deficiency exaggerates the changes of allergic phenomena and bacterial infection in the bronchial asthmatic and why not in the general population as the vitamin D_3 deficiency is endemic in our local populations.[18,19] A proposed mechanism of vitamin D_3 deficiency casues decrease in anti inflammatory cytokine such as the IL-10.[17] The finding of low vitamin D_3 is consistent to previous studies.[16,17] The previous studies[16,17] suggested the vitamin D_3 deficiency increases the bronchial hyper-responsiveness in response to inflammatory cytokines through dysregulation of cellular signaling pathways. The findings of vitamin D_3 deficiency, raised IgE and blood eosinophils are consistent with previous study,[20] which studied children and reported positive correlation of vitamin D_3 deficiency in childhood allergies. The previous study[20] suggested the vitamin D_3 deficiency as a risk factor of exaggerated allergic reactions in childhood bronchial asthma.[20] Vitamin D_3 deficiency may be considered as a risk factor of exaggerated and altered inflammatory response and allergic reactions in the bronchial asthma. Another study[21] reported vitamin D_3 and serum IgE in a sample of 30 bronchial asthma patients during acute exacerbation and after remission. Severe vitamin D_3 deficiency with increased IgE was found in the asthmatics[21], the finding is in keeping with the present study. The findings of vitamin D_3 deficiency and serum IgE of present study is in agreement with other previous studies.[22-24] Vitamin D_3 levels of <20 ng/ml were noted in 78.66% of bronchial asthma patients[22] and a positive association was noted with severity of clinical symptoms. Other studies[23,24] noted vitamin D_3 deficiency in 67% and 91% of patients respectively, the findings support the observations of present study. Ginde[25] and Eman[26] had reported severe vitamin D_3 deficiency in bronchial asthma. In present study, the vitamin D_3 deficiency was noted with elevated serum IgE levels, the findings are highly consistent with previous studies.[25,26] Previous studies[23-26] found elevated serum IgE level and vitamin D_3 deficiency in bronchial asthma. In the light of above literature review and evidence based findings of present study, it is suggested the vitamin D_3 supplements may improve the health of bronchial asthma patients. One of limitations of present study is the cause effect relationship of vitamin D3 and IgE cannot be ascertained because of cross sectional case control study design. However finding is worth to report as the vitamin D_3 supplements may alleviate the allergen mediated exaggerations of bronchial asthma if they are vitamin deficient.

CONCLUSION

The present study reports elevated serum IgE and low vitamin D_3 in bronchial asthma. Serum IgE and blood eosinophils were negatively associated with vitamin D_3 levels in bronchial asthma. Vitamin D supplements may alleviate the allergen mediated exaggerations of bronchial asthma.

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